



# *Airborne, Maritime/Fixed Station Joint Tactical Radio System*

NPS 6<sup>th</sup> Annual Research Symposium:  
*Networked Warfighter*  
*'A Revolution in Military Affairs'*  
*May 2009*

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# Agenda



- AMF JTRS: Revolution in Military Affairs
- Making the JTRS RMA a Reality
- Total Systems Integration Realities



# Revolution in Military Affairs

‘...a major change in the nature of warfare brought about by the innovative application of new technologies which, combined with dramatic changes in military doctrine and operational and organizational concepts, fundamentally alters the character and conduct of military operations’.

Dr Andrew Marshall  
Director of the Office of Net  
Assessment



# Historical Examples

- Crossbow
- Gunpowder
- Cannon
- Air Power
- Radio
- Networks...

**Worst-case scenario is an "RMA breakout" by an adversary!**





# Revolution in Battlespace Awareness



From This to....



**The Revolution in Battlespace Awareness begins with the network-centric enabler (JTRS); NOT another Radio!**



# AMF JTRS Networked Device: 'Everything is in the Box'





# Information Capability







# AMF JTRS Warfighting Advantage

Opportunity

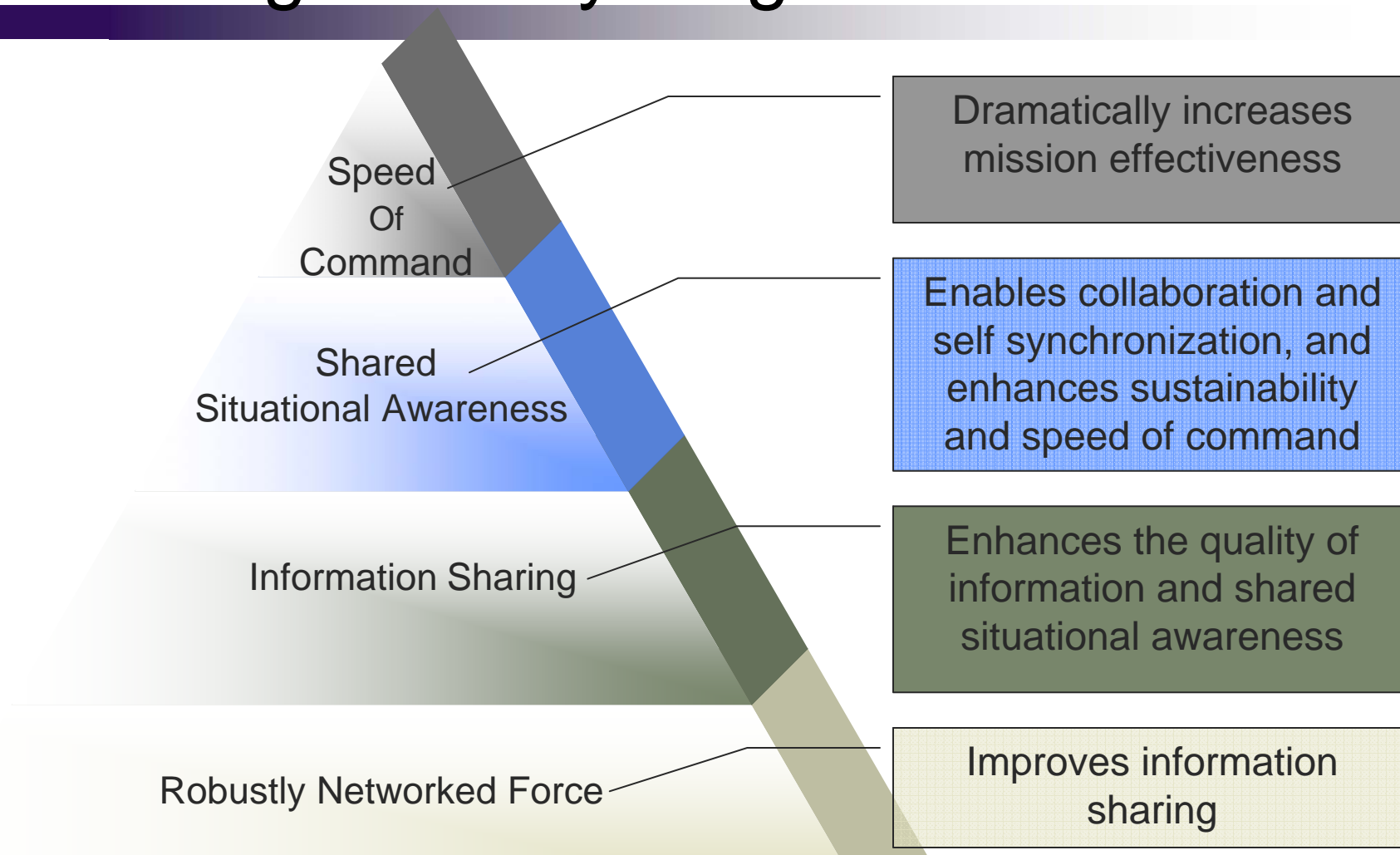
- The opportunity now exists for our Military to make enormous gains in its ability to share information (extend reach)

Change

- Changes in the flow of information could be dysfunctional if these changes were not also accompanied by changes to concepts of operation, doctrine, organization, command concepts, training, and other elements of a mission capability package



# Networked Warfighting: Changes Everything



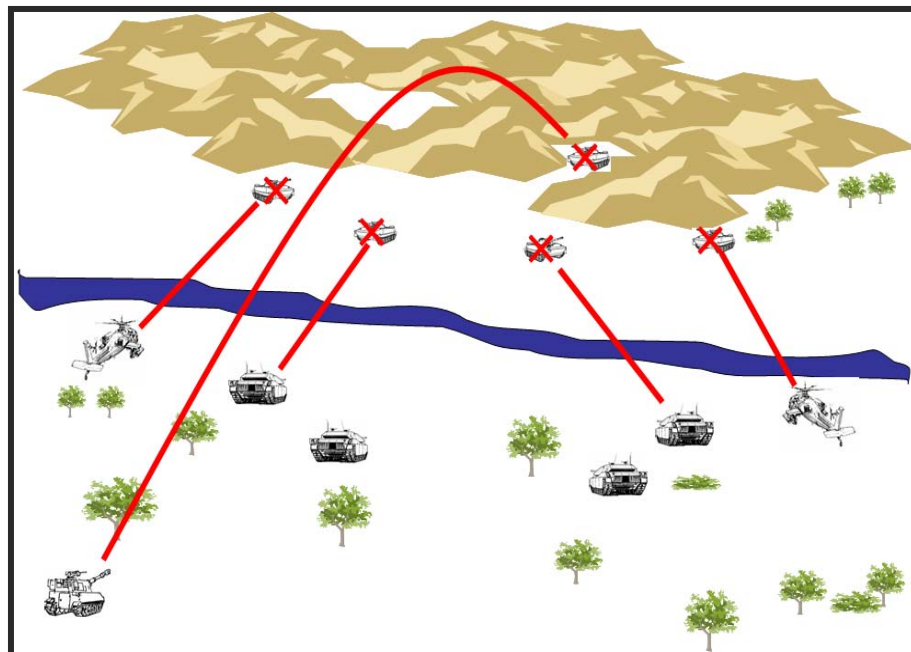
**Warfighters will be able to dominate any situation; and day-to-day operations will be optimized with accurate, timely, and secure information**



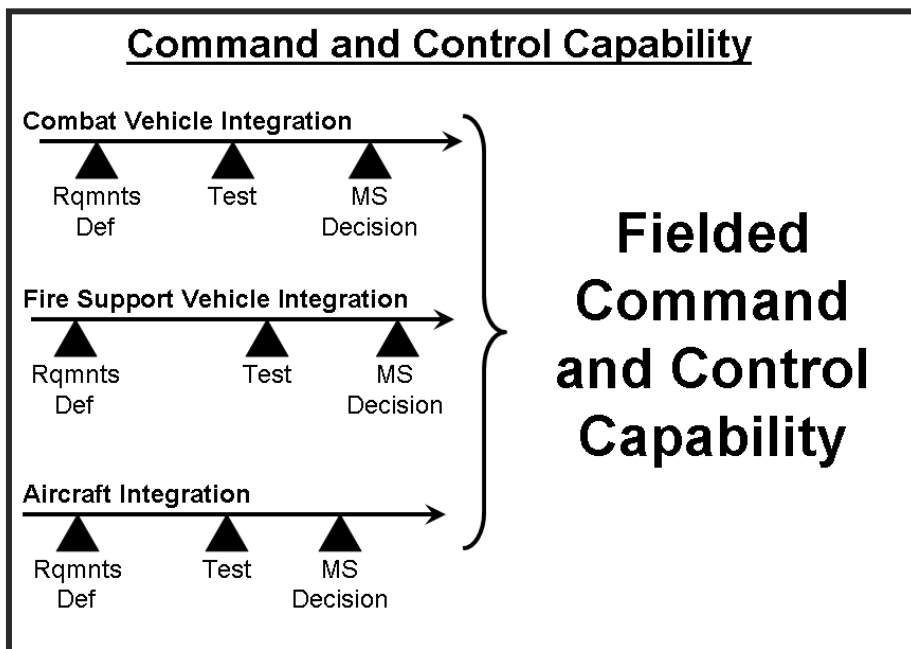
# ***‘A Systems of Systems Solution’***



# Synchronize Acquisition with Warfighter



*On the battlefield all components have to function as a cohesive force in order to achieve success*

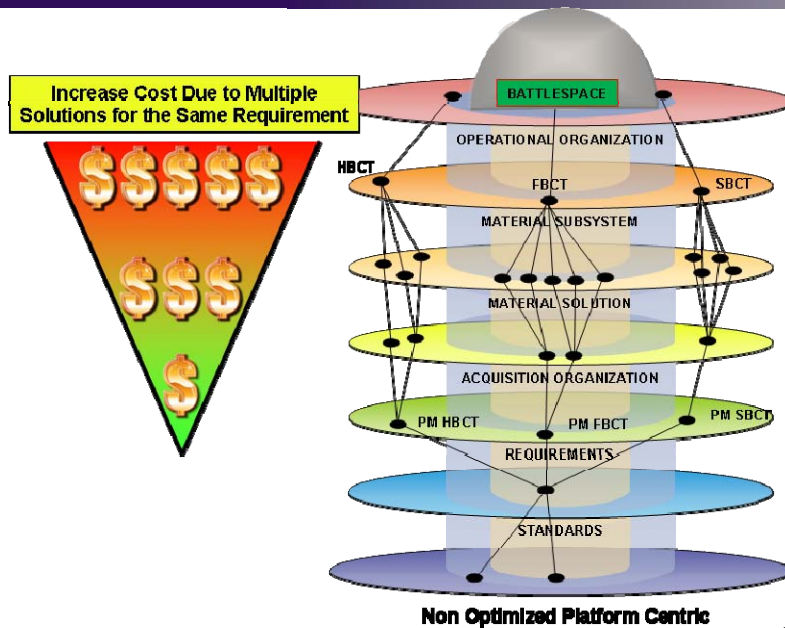


*Same is true for the acquisition of a capability. Multiple organizations need to be synchronized in order to achieve success*



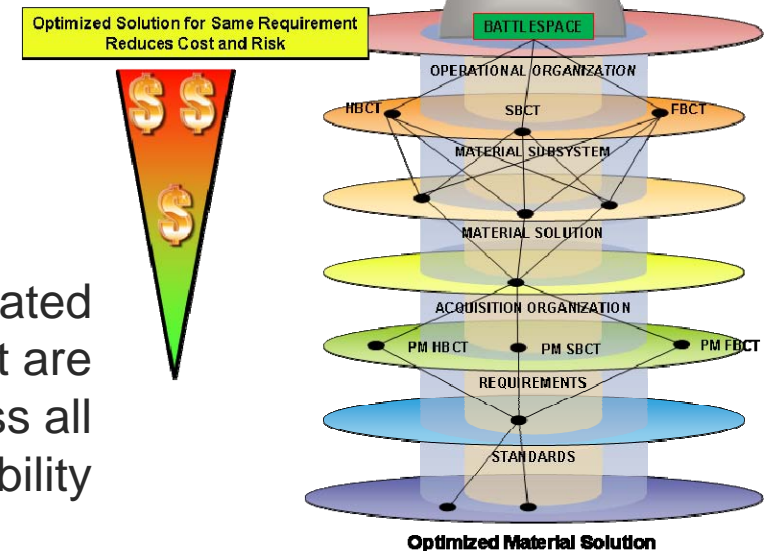


# Capabilities Management Challenge



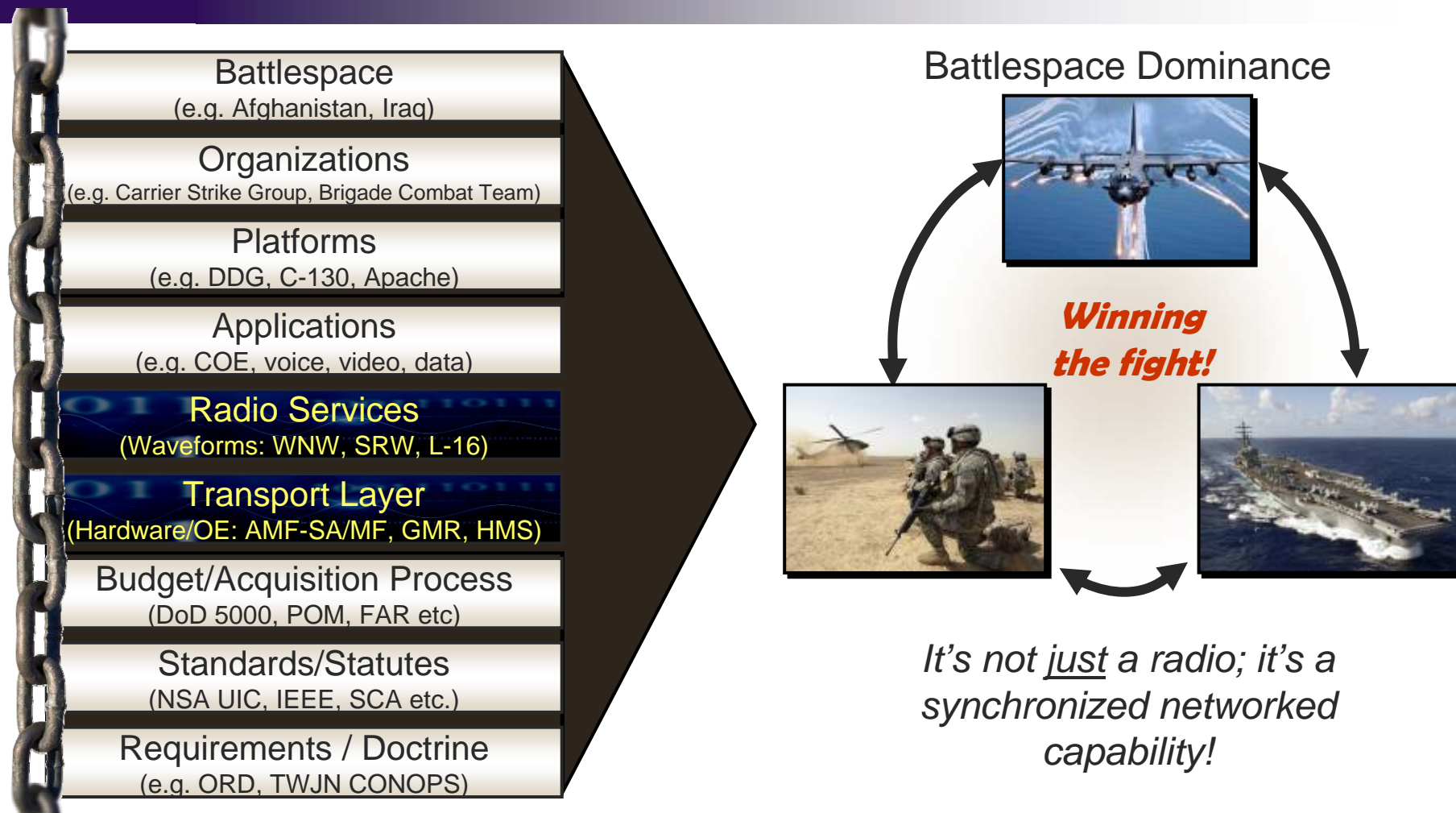
Multiple, independent solutions increasing burden on the unit and impacting overall capability

Fewer, well coordinated materiel solutions that are employed consistently across all systems & optimizing overall capability





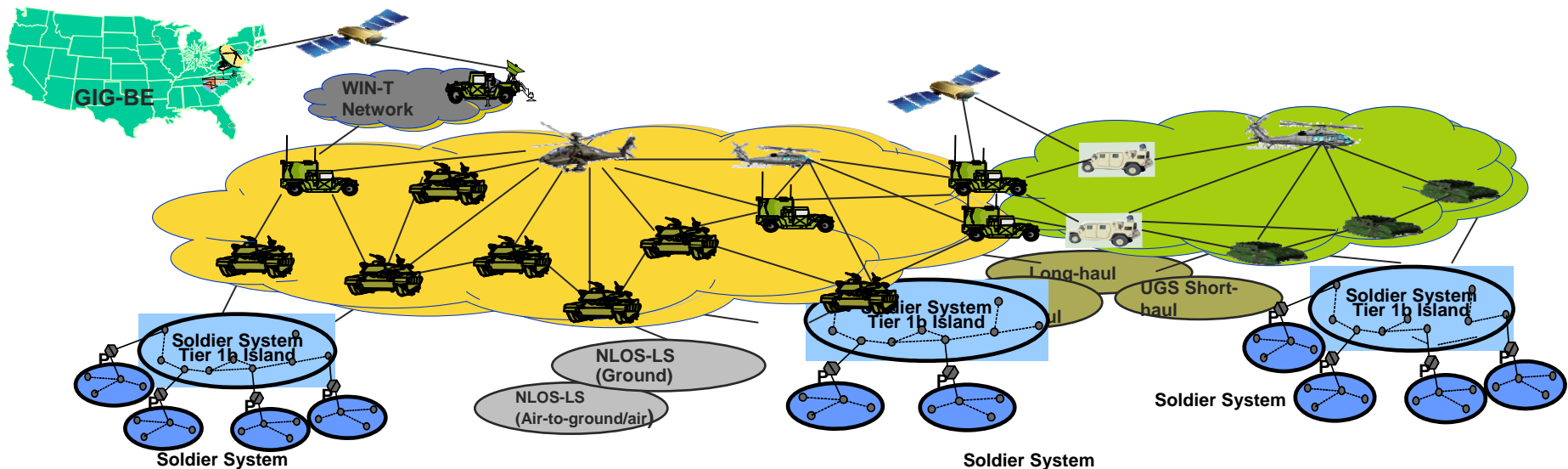
# Networked Dependencies



**To provide Battlespace networked communications,  
all layers are interlinked and dependent**



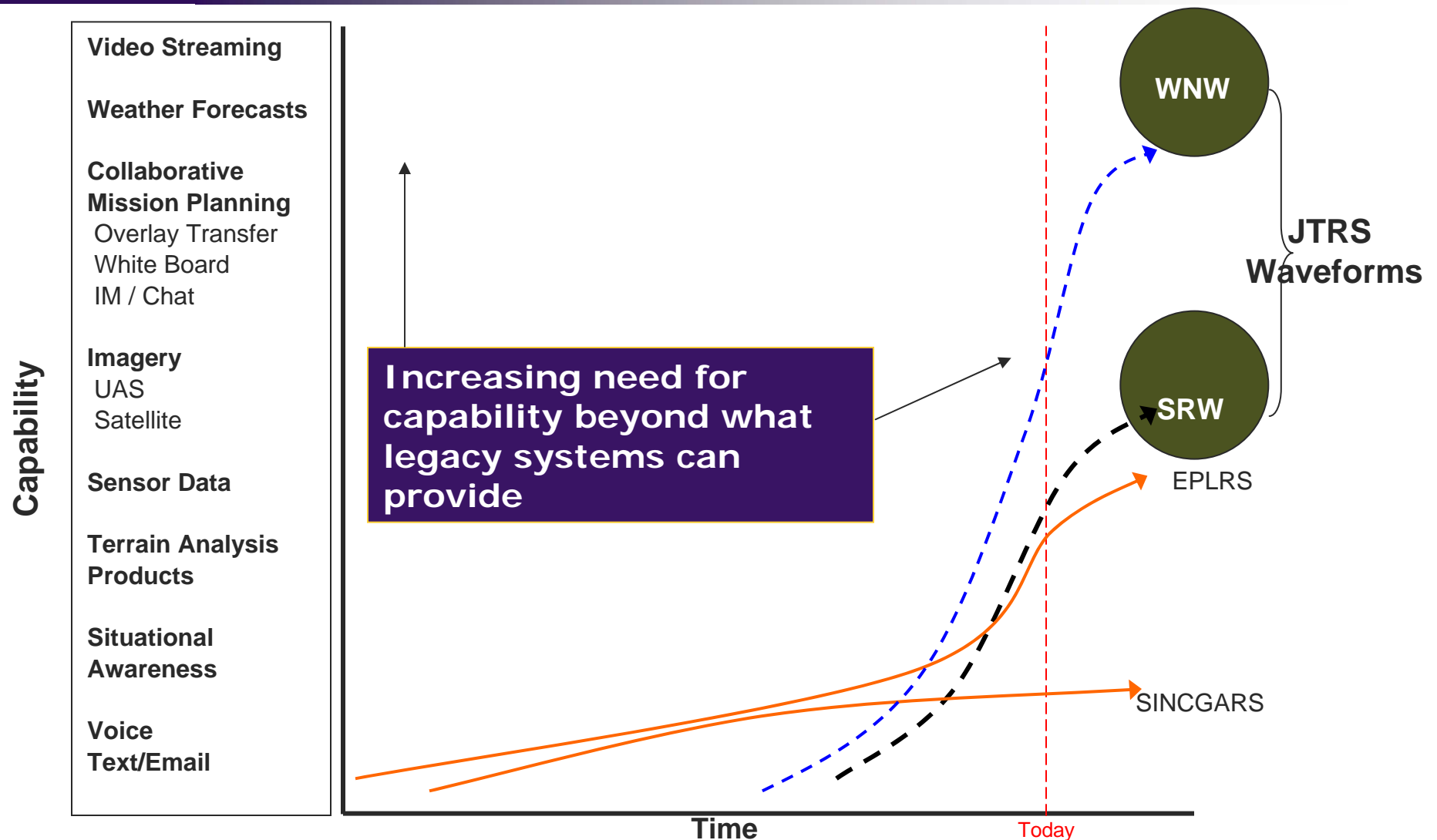
# WNW and SRW: Components of a Layered Tactical Network



- **Integrated WNW and SRW Ground Domain network provides the dynamic, scalable, mobile network architecture for tactical network communications**
  - **WNW** provides necessary large scale, highly mobile wide area backbone
    - Interconnects SRW stub networks to form integrated ground domain network
    - Dynamic IP routing, IP encryption, IP QoS for GIG interoperability
    - Leverages advantaged nodes to enhance network extensibility and performance
  - **SRW** provides critical tactical edge connectivity for the dismounted operator and sensor networks where battery conservation is at a premium
  - **JTRS Enterprise Network Manager** provides a single, user-friendly system to plan, monitor and "over-the-air" reconfigure the integrated WNW/SRW



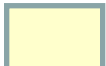
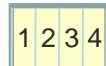
# Required Capabilities in an Integrated Net-Centric Environment





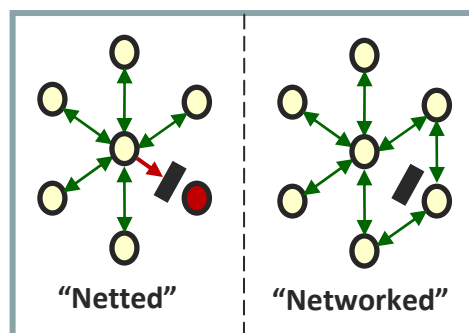


# Current vs. JTRS Capabilities

Current	Future
<b>Legacy</b>  <b>"Fixed" Waveform</b>	<b>AMF</b>  <b>"Selectable" Waveforms</b>

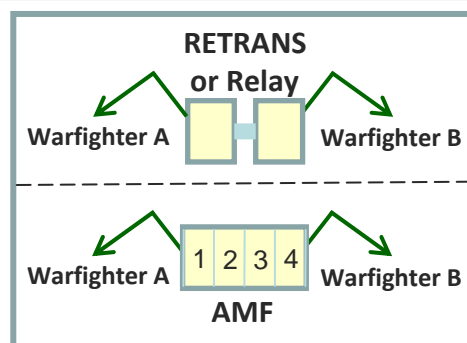
Current radio systems are designed to operate in a specific or "fixed" spectrum / waveform. **Future advancements limited and costly**

AMF can individually "select" the specific spectrum/waveform for each channel → **provides operational flexibility as technology advances**



Communications between current "netted" radio systems are dependent upon line of sight with all stations in a net. **Single point of failure**

In a JTRS "networked" sub-net all stations can communicate as long as there is line of sight to any other station that has line of sight with the source / originating station. → **Information Assurance of delivery**



For current radio systems – two retransmission (RETRANS) or Relay radios are required to connect stations – or - other nets not within line of sight of the originating radio. **Communications are vulnerable to failure**

JTRS provides this connectivity between channels internal to the radio system --- connecting different sub-nets or access to higher level networks → **Built in capability**



# Composition of Integration Cost (Longbow Apache Example)



## TOTAL INTEGRATION COST (Installed Capability Cost)

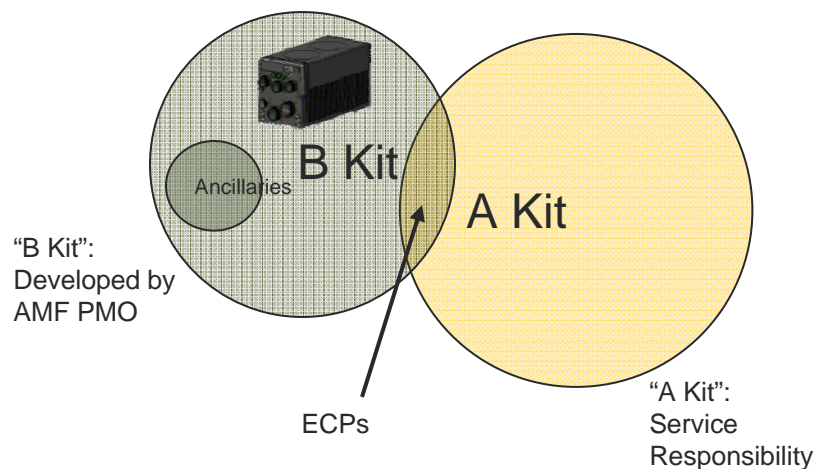
### Design

- B-Kit NRE
- B-Kit EDM
- A-Kit NRE
- Platform Integration NRE
- Platform Quals & Certs

### Production

- B-Kit Production
- A-Kit Production
- A & B Kit Installation

Design Integration Costs (R&D) are one-time (per platform type) while "production" integration costs are recurring but typically decrease with time (learning curve)





# Design Integration Costing Methodology



## Determining Design Integration Costs (ACTUAL)

$$DTIC_{R\&D} = BKitNRE + \sum_1^n BKitEDM + \sum_1^n AKitNRE + \sum_1^n PlatformIntegrationNRE + \sum_1^n Qual$$

	AMF SDD Contract Cost	For Each Platform Class (n) EDM cost	For Each Platform Class (n) A Kit material cost	For Each Platform Class (n) Platform Integration labor cost	For Each Platform Class (n) Qual/Cert cost
<b>Data Source</b>	AMF PMO	AMF PMO/Services	Services	Services	Services
<b>Funding Source</b>	AMF PMO	Services	Services	Services	Services
<b>Cost Category</b>	Design	Material	Design	Design	Test

## Determining Design Integration Costs (ROM)

$$eDTIC_{R\&D} \approx BKitNRE + \sum_1^n BKitEDM + \sum_1^n (BKitNRE * x_n) + \sum_1^n (BKitNRE * y_n) + \sum_1^n (BKitNRE * z_n)$$

	AMF SDD Contract Cost	For Each Platform Class (n) EDM cost	For Each Platform Class (n) A Kit material cost based upon a historical percentage of the BkitNRE cost	For Each Platform Class (n) Platform Integration labor cost based upon a historical percentage of the BkitNRE cost	For Each Platform Class (n) Qual/Cert cost based upon a historical percentage of the BkitNRE cost
<b>Data Value</b>	AMF SDD Contract Cost	AMF SDD Option CLIN And Quantities	"A Kit" Historical ROM	"Platform Integration" Historical ROM	"Qualification" Historical ROM

**ROM Methodology - Estimate costs as percentage of radio development effort (i.e. BKitNRE)**

$$(x \approx HistoricalAkitNRE \div HistoricalBkitNRE)$$

$$(y \approx HistoricalIntegrationNRE \div HistoricalBkitNRE)$$

$$(z \approx HistoricalQualNRE \div HistoricalBkitNRE)$$